Implications of Electronic Mail and Message Systems for the U.S. Postal Service

Summary

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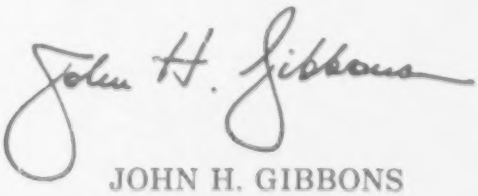
Foreword

This study of the implications of electronic mail and message systems (EMS) for the U.S. Postal Service (USPS) is one of four components of the OTA assessment of Societal Impacts of National Information Systems. It should be read along with the September 1981 OTA report on *Computer-Based National Information Systems: Technology and Public Policy Issues*, which provides the larger context for understanding EMS-related public policy questions. Also relevant is the March 1982 OTA background paper on *Selected Electronic Funds Transfer Issues: Privacy, Security, and Equity.*

The House Committee on Post Office and Civil Service, one of the original requesting committees, indicated an interest in the possible impact of EMS and electronic funds transfer (EFT) on the USPS mailstream and labor force, and implications for the future role of USPS in electronic mail and message systems. The Senate Committee on Governmental Affairs, Subcommittee on Civil Service, Post Office, and General Services, expressed a similar interest. In response, OTA initiated a review of relevant EMS and EFT developments since the completion of the work of the Commission on Postal Service in 1977. Several working papers and computer-based models were developed by OTA staff and contractors. These were reviewed by an OTA advisory panel representing postal, labor, telecommunication carrier, computer service, business, academic, and consumer interests. On the basis of that review, a revised and integrated report was prepared.

OTA appreciates the participation of the advisory panelists, external reviewers, and others who helped bring this study to fruition. It is, however, solely the responsibility of OTA, not of those who so ably advised and assisted in its preparation.



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Director

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Roy Amara
President
Institute for the Future

Paul Baran
President
Cabledata Associates

Harold P. Belcher
General Manager for Advanced Mail R&D
U.S. Postal Service

Robert L. Chartrand, *ex officio*
Senior Specialist in Information Technology and Policy
Congressional Research Service

Kent W. Colton
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Stanford University

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Program in Science, Technology, and Society
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Manager, Business and Services Planning
Bell Northern Research Laboratory

Jacques Vallee
President
Infomedia

Carl Vorlander
Executive Director
National Association for State Information Systems

Fred W. Warden
Former Director, Telecommunication Relations
IBM Corp.

Willis Ware
Senior Computer Specialist
The Rand Corp.

Iram Weinstein
System Planning Corp.

Alan F. Westin
Professor of Political Science
Columbia University

*Resigned in late 1979.

OTA Electronic Message Systems Project Staff

John Andelin, *Assistant Director, OTA*
Science, Information, and Natural Resources Division

Sam Hale, *Interim Program Manager*
*Communication and Information Technologies**

Fred B. Wood, *Project Director***

Jean E. Smith, *Study Coordinator*

Zalman A. Shavell, *Senior Analyst*

Fred W. Weingarten, *Senior Analyst*

Elizabeth A. Emanuel, *Administrative Assistant*

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Jeanette Contee, *Wordprocessor*

Contractors

Charles C. Joyce, Jr., and Jeffrey Held,
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Keith Geeslin, Walter Hinchman Associates, Inc.
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Michael F. Cavanagh, Cavanagh Associates
Robert Anthony, Mitre Corp.
Robert Johansen, Institute for the Future
Harley W. Radin, Consultant

OTA Publishing Staff

John C. Holmes, *Publishing Officer*

John Bergling Kathie S. Boss Debra M. Datcher Joe Henson

*March 1981 through February 1982; Stephen E. Doyle served as Program Manager through February 1981; Fred W. Weingarten was appointed Program Manager effective March 1982.
**Since June 1979; Ruann E. Pengov served as Project Director through May 1979.

Electronic Mail and Message Systems

Overview

Advances in communication and computer technology provide new ways to convey messages and carry out financial transactions. These are called electronic mail and message systems (EMS) and electronic funds transfer (EFT) systems. Commercially offered EMS and EFT will increasingly compete with portions of the traditional market of the U.S. Postal Service (USPS). While there is disagreement on how fast EMS and EFT markets may develop, it seems clear that **two-thirds or more of the current mailstream could be handled electronically**, and that **the volume of USPS-delivered mail is likely to peak in the next 10 years.** Any significant decline in the volume of mail has implications for future postal rates, USPS service levels, and labor requirements.

A key policy issue requiring congressional attention is how USPS will participate in the provision of EMS services, both in the near term and in the longer term. If USPS does not attract and keep a sizable share of the so-called Generation II EMS market (which requires delivery of hardcopy output) and conventional (especially first-class) mail volume declines, USPS revenues will probably go down, with the likelihood of an unfavorable impact on rates and/or service levels. If USPS does develop a major role in the Generation II EMS market, and if Generation II EMS costs are low enough, the effect on USPS rates and/or service could be favorable.

Two of the major factors influencing USPS labor demand are total mail volume and worker productivity. Regardless of whether USPS participates in Generation II EMS, improving worker productivity and eventually declining conventional mail volumes could lead to considerably lower labor demands in the future. If USPS does participate successfully in Generation II EMS, this potential decline in labor requirements could be deferred or partially offset.

USPS is already involved in EMS to a limited extent. For example, it delivers some industry EMS hardcopy, provides a portion of Western Union's Mailgram service, and in January 1982 introduced a domestic service called "electronic computer-originated mail" or E-COM. (In E-COM, USPS accepts letters in electronic form, converts them to hardcopy, including printing and enveloping, and delivers them.) The role of USPS in EMS activities is already controversial, and it is likely to become more so if its role expands.

As a result of technological advances, historical (and legal and regulatory) distinctions between conventional and electronic mail have blurred, along with the application of the the congressional mandates embodied in the Postal and Communications acts. **Absent congressional action to provide a clear direction for USPS and to clarify or redefine regulatory boundaries, the controversy over the USPS role in EMS is likely to continue indefinitely and Generation II EMS opportunities for USPS, private telecommunication carriers, and mailers may be lost.**

OTA identified a number of areas related to USPS participation in EMS that warrant congressional consideration:

- **Potential Contribution to USPS Mail Volume.**—A USPS role in Generation II EMS has the potential to provide a volume "cushion" to partially offset reductions in conventional mail. Since private firms are neither willing nor able to duplicate the nationwide physical delivery infrastructure of USPS, any large-scale Generation II EMS service depends on the participation of USPS. There is, however, little consensus on what USPS role would be most conducive to growth of Generation II traffic (and hence USPS mail volume).
- **Potential Contribution to USPS Finances.**—While Mailgram apparently provides both a substantial avoidance of conventional USPS mailstream costs and a significant contribution to covering USPS fixed costs, it is not clear whether E-COM would do likewise at current rates and in its present configuration. All parties, including USPS, agree that the original E-COM cost estimates prepared in 1978 for the Postal Rate Commission are now outdated. A comprehensive cost review of E-COM is needed if its contribution to USPS finances is to be understood.
- **Impact on USPS Labor Force.**—USPS labor force requirements are sensitive to mail volume. Any significant decline in mail volume for whatever reasons (e.g., diversion to EMS and EFT, competition from nonelectronic alternative delivery services, reduced demand due to general economic recession) would translate into labor force reductions beyond those that may be needed as a result of higher worker productivity.

  USPS participation in Generation II EMS would have two effects on USPS labor requirements. A small number of new jobs would be created to carry out EMS-related activities, and a considerably larger number of jobs would be required in traditional USPS activities to process and deliver the resulting hardcopy. Thus, USPS participation could offset, or at least defer, some of the reductions in the existing labor force that might otherwise be necessary. The need for sizable reductions from the present level of employees is not likely to be felt until the late 1980's or early 1990's.

- **Size and Nature of the E-COM Market.**—OTA concluded that prior estimates of the Generation II market have probably been high, and that prudent planning should be based on a mature market (20 years hence) in the range of 7 billion to 17 billion messages annually, rather than 25 billion as previously estimated by RCA (for comparison, conventional mail in 1981 totaled 110 billion pieces). Even the lower estimate depends on mailer acceptance and successful institutional marketing strategies. Several modifications to E-COM have been proposed that deserve consideration, such as 1-day guaranteed delivery rather than 2-day, flexible letter formats, and the use of telecommunication carrier and mailer logos to personalize the E-COM output and provide incentives for aggressive marketing. A full review of the E-COM market should include governmental as well as private sector mailing needs.
- **Impact on Competition.**—USPS believes its participation in E-COM is authorized by the Postal Reorganization Act mandate to use new facilities and equipment to improve the convenience, efficiency, and cost effectiveness of mail service. However, various telecommunication and computer firms view E-COM as: 1) the entry of a Federal agency into competition with private industry; 2) possibly subject to the Communications Act as well as the Postal Act; and 3) raising questions about the fairness and legality of a USPS role in EMS in general. The applicability of the Private Express Statutes to delivery of Generation II EMS hardcopy output has also been challenged.
- **Regulatory Jurisdiction.**—The E-COM case has surfaced disagreements over the division and extent of regulatory jurisdiction by the Postal Rate Commission and Federal Communications Commission. As a result, USPS brought suit against both commissions and the Department of Justice brought suit against USPS—all on jurisdictional grounds, not on the merits or faults of E-COM. Some private firms believe this demonstrates the difficulty of regulating USPS ratesetting and preventing the potential cross-subsidization of E-COM from conventional mail revenues. One proposed response to that concern would be to require a separate USPS entity for any EMS offering.
- **E-COM Privacy and Security.**—The involvement of USPS in E-COM has pointed out the need for additional security measures to protect the privacy of EMS messages. The Postal and/or Communications Act may need to be amended to provide additional statutory privacy protection.
- **Role in Telecommunication and/or Generation III EMS.**—The USPS role in E-COM does not involve either telecommunication or electronic delivery. Whether there are conditions that would constitute demonstrated need for USPS to contract with a telecommunication carrier to transmit messages electronically on behalf of USPS needs to be clarified. Further study seems war-

ranted on the possible use of EMS Generation III (as well as Generation II) to help USPS maintain adequate service levels to rural and less populated areas and to low volume, nonprofit, and educational mailers (E-COM is currently designed for high-volume business mailers.)

- **Increased Cooperation with the Private Sector.**—At present, it is difficult for USPS to conduct effective long-range planning and market testing of EMS, since this requires good working relationships with private telecommunication and computer firms. If some clearer consensus can be reached on the direction and limits of USPS involvement in EMS, perhaps a more constructive relationship with the private sector can develop.

OTA's analysis suggests that advances in technology and increased competition in the communications marketplace will significantly affect USPS finances, service levels, and labor force requirements over the next two decades. It further suggests that modification or clarification of the USPS role in EMS can, in turn, help determine how effectively USPS accommodates to these changes. Given the difficulty of modifying institutions as large and complex as USPS and the laws and regulations that govern USPS actions, it would seem prudent for Congress and USPS to address these issues aggressively. Changes are taking place so fast in the so-called "communications revolution" that by the time USPS actually experienced significant reductions in conventional mail volume, most opportunities for participation in EMS would have passed and it would be much more difficult to adjust.

Introduction

This study addresses three major questions:

1. To what extent are privately offered electronic mail and message systems (EMS) and electronic funds transfer (EFT) systems likely to affect the volume of mail handled by the U.S. Postal Service (USPS)?
2. Are changes in USPS mail volume likely to lead to significant adjustments in USPS rates, service levels, and/or labor force requirements? and
3. What are the implications of EMS for the future of USPS and how it might participate in the provision of EMS services?

These questions are of concern because historically USPS has served a variety of social purposes mandated by Congress, such as "to bind the Nation together through the personal, educational, literary, and business correspondence of the people" and to provide mail service "to (postal) patrons in all areas . . . and all communities," including rural areas, communities, and small towns (Postal Reorganization Act of 1970). In recent years, there has been a continuing revolution in computer and communication technology, a gradual deregulation of

the telecommunication industry (the computer industry being essentially unregulated), and a proliferation of new and old firms offering or planning to offer EMS and EFT services that compete with portions of the traditional USPS market. Technology is, in effect, blurring the historical (and legal and regulatory) distinctions between conventional and electronic mail.

USPS is already involved in EMS to a limited extent. It currently delivers some industry EMS hardcopy output, provides a portion of Western Union's Mailgram service, and in January 1982 introduced a domestic service called "electronic computer-originated mail" or E-COM. However, the role of USPS in EMS in general, and in E-COM in particular, continues to be in dispute before various regulatory agencies, the courts, and Congress. USPS believes its participation in EMS is authorized by the Postal Reorganization Act mandate to use new facilities and equipment to improve the convenience, efficiency, and cost effectiveness of mail service. Various mailer organizations, consumer groups, and postal labor unions see a USPS role in EMS as essential to USPS long-term viability and to maintaining, or at least minimizing any reductions in, mail services that are vital to a large part of the U.S. population. They point to the critical role of USPS in providing a universal, low-cost, nondiscriminatory nationwide communication service. Various private telecommunication and computer firms view USPS involvement in EMS as the entry of a Federal agency into competition with private industry (possibly subject to the Communications Act as well as the Postal Act), raising difficult questions of ratesetting and potential cross-subsidy.

There are no easy answers to the questions addressed in this study. Prior studies have proven to be oversimplified. In order to better understand the complexities involved, OTA used computer-based models to project independently the levels of conventional and electronic mail volumes under different sets of assumptions, and to project the possible effects of changes in USPS mail volumes on USPS rates, service levels, and labor requirements. Still, while computer modeling permits consideration of a larger number of variables and interrelationships than would otherwise be possible, the precision of the projections can be misleading. The models are highly sensitive to initial assumptions and have limited ability to anticipate unexpected events. *The study as a whole, and the use of computer modeling in particular, is intended to help Congress better understand the possible implications of EMS for USPS, and is not intended to make a prediction of the future course of events.*

USPS Mailstream

To a substantial extent, the volume of USPS-delivered mail in the future is beyond the direct control of USPS. It will be affected by diversion to electronic modes of "written" communication (EMS and EFT),

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by overall economic factors, and by competition from private message and parcel delivery systems. Taken together, it seems clear that two-thirds or more of the mailstream could be handled electronically, and that the volume of mail is likely to peak in the next 10 years and fall below today's level sometime in the 1990's.

EMS penetration of the mailstream will be paced by the introduction and widespread use of technologies such as high-quality electronic printers, office automation, home computer terminals, viewdata/teletext, and inexpensive home hardcopy terminals. EFT will be paced by the increased use of automated teller machines and point-of-sale terminals, and consolidation of bills and payments through telephone bill payer, debit cards, and direct deposit. In the long run, both EMS and EFT are likely to be possible over the same electronic terminals and communication networks. But in the shorter term, they are separate technologies. EMS itself has two distinguishable modes—Generation II EMS (electronic input and transmission with hardcopy output) and Generation III EMS (all-electronic). This diversion of mail from conventional paper-based to electronic form is likely to stretch over many years and probably decades, depending on the rate of technological advance, on future postal rates, on regulatory constraints, and in part on intangible factors such as consumer acceptance and institutional marketing strategies.

OTA made several estimates of the rate of diversion of conventional mail to EMS and EFT. Mail diverted to Generation III EMS and EFT was assumed lost to the USPS mailstream. Because of the need to sort and deliver the hardcopy output from Generation II EMS, mail diverted to Generation II EMS was assumed to remain in the USPS mailstream. Mailgram and E-COM are Generation II services. In all of 1980, about 40 million Mailgrams were sent; in the first half-year of its existence (January through June 1982), about 660,000 E-COM messages were sent. During July 1982, E-COM averaged about 172,000 messages *weekly*. USPS also delivers an unknown, but small, number of letters that represent the hardcopy output of private sector Generation II EMS.

OTA did not independently estimate overall future economic growth or competition from private delivery services; representative past growth rates of the USPS mailstream were projected into the future. For example, the USPS mailstream has grown by about 2 percent per year if averaged over the 1900-77 period, and 3 percent over the 1947-77 period. In 3 of the last 4 years, the growth rate exceeded 3 percent. However, between 1971 and 1976, the growth rate was only about 1 percent.

If the recent 3 percent growth rate held for the next 20 years, USPS *conventional* mail would exceed the 1981 level (110 billion pieces) until the mid-1990's, even in the face of competition from high but plausible EMS and EFT growth. Assuming that USPS delivers the hard-

copy output from Generation II EMS in that timeframe, USPS *total* deliveries would exceed the 1981 level until the turn of the century. Similarly, at 2-percent annual growth, and the same conditions, USPS *conventional* mail volume would exceed the 1981 level until about 1990, and *total* mail until the mid-1990's.

OTA conducted several sensitivity analyses to determine the conditions under which the USPS mailstream might decline even faster. OTA concluded that one such condition would be continued economic recession or depression, which in the past (early 1970's and early 1930's) has resulted in a flat or even negative mailstream growth. This, coupled with even faster than anticipated introduction of all-electronic Generation III EMS and EFT, or escalation of USPS costs and rates above the level of alternative conventional and electronic delivery services, would accelerate the decline of the USPS mailstream.

Regardless of the underlying mailstream growth, the effect of Generation II EMS volume is to "cushion" or offset some of the decline in conventional mail, assuming USPS delivers the Generation II hardcopy output. Put differently, if Generation II volume reached significant levels, USPS-delivered mail volume (conventional plus Generation II) might be maintained at or above a given level for an additional 5 years or so.

For planning purposes, it is reasonable to assume that mail volume is likely to remain strong for most of the 1980's, and decline significantly in the 1990's. Under any plausible scenario, USPS is still likely to be handling a large volume (70 billion to 110 billion pieces) of mail in 2000.

Independent of the total USPS mailstream, the size of the potential Generation II EMS market itself takes on considerable importance with respect to decisions concerning USPS involvement. OTA has concluded that prior market estimates probably have been high. For example, RCA Corp. previously estimated a mature Generation II market (20 years hence) of 25 billion pieces. However, this exceeds even OTA's high but plausible Generation II projection by roughly 40 to 80 percent, depending on the underlying growth in demand for mail. It appears that RCA was overly optimistic about Generation II market development, ignored competition with Generation III EMS services, or both. OTA also identified a slow-growth Generation II path that projects a volume of about 40 million messages 5 years hence, increasing to about 600 million messages after 10 years and around 3 billion after 15 years. Given the highly volatile and unpredictable nature of the EMS market, it appears that prudent planning should be based on a maximum of one-half of the RCA-projected volume on down to the OTA-projected volume for Generation II slow growth. This would place the projected Generation II market 20 years hence in the range of 7 billion to 17 billion pieces rather than 25 billion.

There are legitimate differences of opinion as to how Generation II would fare after 2000, which was beyond the timeframe of the OTA study. Some analysts believe that Generation II would taper off very slowly and remain significant for many years. Others are convinced that Generation II might decline rather precipitously. However, it is likely that Generation III would surpass Generation II in absolute volume well before 2000. Indeed, unless Generation II grows at a high or very high rate, it is possible that Generation II would never exceed Generation III. Various private telecommunication carriers have indicated that most research and development (R&D) and marketing effort is going into Generation III, not Generation II.

USPS Rates and Service Levels

USPS has some control over the way in which changes in mail volume might be reflected in rate and service level adjustments. While USPS is not allowed to make a profit overall, it need not "markup" all classes and subclasses of mail by the same amount over the costs specifically allocatable to each. Thus, individual classes and subclasses make varying contributions to covering common ("fixed") costs. For example, first-class mail, with high volume and relatively high markup, historically has made the largest contribution to fixed costs of any class of mail. In fiscal year 1980, first-class mail made up about 57 percent of the total mailstream. Its contribution to USPS fixed costs was about $4.2 billion, based on an actual volume of 60 billion pieces (and assuming 20¢/piece revenue and 13¢/piece variable cost). This was about 55 percent of total fixed costs ($7.6 billion) in that year.

The example of first-class mail just cited is particularly relevant to this study because it is likely that most of the conventional mail diverted to EMS or EFT over the next 20 years will be first-class mail. Not only does it represent the largest volume of mail, but it is generally more amenable to electronic transmission than are other classes. Three-quarters of first-class mail is made up of correspondence, negotiable instruments (e.g., checks), and bills and financial statements.

If the first-class mailstream declined 10 billion pieces by the year 2000, and the 1980 cost and markup is assumed, first-class mail would contribute $700 million less to USPS fixed costs than it does today. Making up that loss by raising first-class rates alone would require a 7-percent increase. To the extent that USPS was delivering Generation II EMS hardcopy and making a profit on it, some or all of this rate increase could be avoided. This latter possibility is highly dependent on the cost of Generation II EMS (not well known) and the market price (also not well known).

Cost cutting would ease the necessity of increasing rates. This strategy would be particularly prudent if first-class rate increases would

lead to a further volume reduction, which could set off a spiral of rate increases and volume reductions. Whether or not cutting costs would result in service cuts would depend in part on the USPS cost structure. Under the current cost structure (36 percent fixed costs, 64 percent variable), some service cuts would appear to be necessary. For example, USPS officials have estimated that delivery 5 days a week (instead of 6) would save about $650 million (1980 dollars). A 1976 USPS staff study projected a $1.1 billion (1977 dollars) savings for delivery 3 days a week.

In the longer term, USPS fixed costs may be reduced below the current 36 percent; other ways to improve productivity might be identified such that service levels could be maintained even at lower volumes and revenues. However, some significant portion of USPS costs clearly is required to pay for maintaining the basic nationwide delivery system and infrastructure, largely irrespective of the volume. For example, a substantial number of carriers are required to cover the approximately 69 million city USPS delivery points and 15 million rural delivery points (as of 1980) each day, 6 days a week, and to maintain window service at over 30,000 post offices, 9 hours or more a day, 5 or 5½ days a week. Likewise, some minimum level of truck transportation between post offices must be maintained to meet delivery performance standards, regardless of whether the trucks are carrying several dozen or several thousand letters. Labor currently accounts for about 85 percent of USPS costs and transportation about 7 percent (largely for trucks and other postal vehicles, plane and rail transportation). Thus, from this perspective, it is not clear that fixed costs could be reduced substantially without cutting service levels.

In sum, any projections of USPS revenues, costs, and rates are difficult at best, given:

1. the complexity of USPS revenue and cost relationships;
2. the fact that costs obviously vary by type of mail route (e.g., urban, suburban, rural), although USPS does not collect such cost data;
3. the problem of how to assign common costs properly to different mail services;
4. the uncertainty in determining what costs are variable with volume changes over various time periods; and
5. the uncertainty over future costs, rates, and volumes of Generation II EMS.

Labor Requirements

USPS is a labor-intensive organization, with labor representing about 85 percent of total USPS costs. By making assumptions about the kind of service provided by USPS, the division of labor among its employees, and their productivity, it is possible to estimate the labor requirements for projected future mail volumes.

For the purposes of this labor force analysis, OTA assumed that the kind of service provided by USPS (service levels) would remain constant. That is, there would be no change in the number of delivery days (e.g., 6 days a week), post offices (over 30,000), weekday window service hours (typically 9 hours), or city and rural delivery points (over 84 million).

OTA calculated the division of labor among USPS employees by assuming that each functional group of employees would allocate their time in the future the same as they do now. That is, each employee group spends a certain fraction of its time in activities that are independent of the volume of mail ("fixed labor"); most groups also spend time in activities that do vary directly with the volume of mail ("variable labor").

OTA estimated variable and fixed percentages for each major group of USPS employees from the USPS fiscal year 1980 Revenue and Cost Analysis. The variable labor percentage is based on the variable attributable cost from the USPS analysis; the fixed labor percentage on the sum of specific fixed attributable costs plus all other institutional costs for each employee group. The variable and fixed labor percentages determined by OTA were reviewed with USPS and found to be reasonable.

The overall cost split for the entire USPS labor force was calculated to be 61 percent variable and 39 percent fixed. Individual employee groups varied from those independent of USPS mail volume to those almost completely dependent on it. As of 1980, 14,268 employees, or about 2.1 percent of the total USPS labor force, had no activities that varied with mail volume. Included would be headquarters, regional, and inspection service employees. On the other hand, almost all of the activities carried out by clerks and mail handlers varied with mail volume (86 percent variable/14 percent fixed). In fiscal year 1980, this group included 303,560 full- and part-time employees, or about 45 percent of the total 1980 USPS work force of 667,000 employees. The clerks and mail handlers would have limited participation in a Generation II EMS service, which would bypass many of the traditional mail sorting and processing functions performed by clerks and handlers. The hardcopy output of Generation II EMS would still require physical delivery by city or rural carriers.

Most other employee groups fall in between, having some activities that vary with total USPS-delivered mail volume (conventional plus Generation II EMS) and some that do not, but with a larger fixed component than clerks and handlers. These would include supervisory and technical personnel (48 percent fixed), city delivery carriers (50 percent fixed), maintenance personnel (about 55 percent fixed), and rural delivery carriers (73 percent fixed).

With respect to productivity, OTA assumed an average labor productivity improvement of 1.5 percent per year as a baseline. For com-

parison, USPS labor productivity is credited as increasing by roughly 3 percent annually during the 1970's, as measured by the number of pieces of mail per workyear. In fiscal year 1970, 741,000 postal employees delivered 85 billion pieces of mail, while in fiscal year 1980, 667,000 employees delivered about 106 billion pieces. The 3-percent figure may not reflect true labor productivity since service levels did change. For example, mailbox collection frequencies (per day) were generally reduced and cluster boxes were substituted for home delivery in many new suburban residential developments. Still, between 1971 and 1980 the number of city delivery points increased by about 21 percent and the number of rural delivery points increased by about 50 percent. Even assuming that the 3-percent annual average during the 1970's is an accurate measure, this does not appear to be a realistic expectation for the 1980's in view of the fact that most productivity improvement from automation and mechanization may already have been realized. Even the expanded ZIP code program, known as ZIP + 4, would realize a total labor productivity improvement of only 2.3 percent, according to USPS estimates.

Taking these variables together, and assuming high but plausible EMS growth, OTA concluded that *the USPS labor force requirement in 2000 is most likely to be roughly 20 to 25 percent below the 1980 level.* This result is projected for the base case of 1.5-percent annual labor productivity improvement and 2-percent annual underlying mailstream growth, and also for the cases of 3-percent productivity improvement/3-percent mailstream growth, and 0-percent productivity improvement/1-percent mailstream growth. Under all three of these scenarios, the need for significant labor force reductions is not likely to be felt until the late 1980's and early 1990's, but would increase quite rapidly thereafter.

Whatever the level of reductions, they are not likely to be spread evenly among all employee groups. The post office clerks and mail handlers group would be expected to be hit the hardest, losing perhaps two-fifths of their 1980 complement by 2000. Post office supervisors and city delivery carriers could, by 2000, be reduced by about one-fifth and rural delivery carriers by about one-tenth of their 1980 complements.

Whether or not these labor force reductions could be handled through attrition depends largely on future USPS retirement, quitting, and new hire rates. But the uneven impact of reductions on various employee groups makes this unlikely. In addition, the uneven distribution of minority employment among employee groups raises the possibility that such reductions may fall disproportionately on black and perhaps other minority employment. For example, as of late 1978, the mail handlers, whose employment would be reduced the most, had one of the highest percentages of black employment. Involuntary labor force reductions in this area, if needed, would likely raise some difficult social and political issues.

Overall, the impact of labor force reductions on promotion opportunities, upward mobility, employee morale, and union contract negotiations could be significant. These areas warrant further study.

Policy Implications

The OTA analysis indicates that, regardless of what role USPS plays in Generation II electronic mail, reductions in USPS-delivered mail volume due to diversion to Generation III EMS and EFT could reach significant levels by 2000. The threat to USPS-delivered mail could come even sooner if Generation III EMS services (all-electronic) develop faster than currently anticipated, if the underlying growth in the mailstream is less than the historical average, or if diversion of second- and third-class mail to alternative (nonelectronic) delivery services increases significantly beyond current levels.

Although a USPS role in Generation II EMS has the potential to provide a volume and revenue "cushion" to partially offset reductions in conventional mail volume and revenue, there is little consensus among USPS and major stakeholders on exactly what the USPS role should be in the provision of Generation II EMS.

The market penetration results indicate that USPS-delivered mail volume (conventional mail plus Generation II EMS hardcopy output) is one key factor in considering a USPS role in Generation II EMS. USPS-delivered volume is a function in part of the rate of Generation II EMS growth. Assuming that USPS delivers Generation II EMS hardcopy output, the faster the rate of growth (and the earlier the takeoff), the larger the Generation II EMS volume and USPS-delivered volume. There is currently little agreement on which USPS role would contribute the most to Generation II EMS growth and volume.

The revenue/cost results indicate that Generation II EMS cost displacement and contribution to covering USPS fixed costs are also key factors in considering a USPS role. The greater the cost displacement (avoidance of conventional mailstream costs) and contribution to covering USPS overhead, the less likely the need for service (and/or labor) reductions. Mailgram apparently provides both a substantial cost displacement and contribution to fixed costs; it is not clear whether E-COM would do likewise at current rates and in its present configuration. All parties, including USPS, agree that the RCA cost estimates prepared for the Electronic Message Service System in 1977 and the original E-COM cost estimates prepared for the Postal Rate Commission in 1978 are now outdated. If E-COM is to be fully evaluated and its role in USPS' future understood, a comprehensive cost review of E-COM is needed.

In contrast, there is general agreement that USPS participation in Generation II EMS would generate only a relatively small number of new jobs. An estimated 200 persons (125 operations, 50 maintenance, 25 marketing and administrative) currently work on E-COM.

A fully deployed service (at 150 serving post offices (SPOs) rather than the current 25) is estimated to require perhaps 2,000 persons. The additional volume from USPS delivery of Generation II EMS hardcopy output could help to offset some of the reductions in the existing labor force that will be necessary if the projected decline in USPS-delivered mail materializes.

Based on interviews with many of the stakeholders and a comprehensive review of the historical record, OTA has concluded that absent congressional action, the controversy over the USPS role in EMS is likely to continue indefinitely. The fairness and legality of a USPS role in EMS, the impact on innovation and competition in the EMS industry, and implications for EMS privacy and security continue to be in dispute. Although the U.S. District Court of Appeals has denied a Department of Justice petition to block E-COM, further regulatory proceedings are anticipated and additional legal actions are possible.

With continuing uncertainty over the future of E-COM, and in general over the USPS role in EMS, the prospects for a successful USPS entry into domestic EMS services are uncertain. This affects both USPS and its potential competitors in the private sector. Some firms have indicated to OTA that they are reluctant to make any major commitments until they are certain what role USPS is going to have. Meanwhile, most private sector R&D efforts are going into Generation III EMS, which would completely bypass USPS. In addition, given the continuing adversarial atmosphere, USPS is unable to establish effective working relationships with many private carriers and potential Generation II EMS users.

Should Congress wish to take action, there are several possibilities: 1) provide a clear direction for USPS involvement in EMS; 2) reduce or eliminate further regulatory and judicial delay; 3) strengthen privacy and security protection; and 4) maintain oversight and initiate planning on USPS long-term viability. These possibilities are outlined below.

Provide a Clear Direction for USPS Involvement in EMS

There is a range of alternatives for a USPS role in EMS:

1. no real involvement other than delivery of Generation II EMS hardcopy output when deposited into the mailstream;
2. delivery of all hardcopy output when conveyed over postal roads;
3. hardcopy delivery plus location of carrier-provided EMS terminal equipment on USPS premises (as in Mailgram);
4. the current E-COM role or variations of it (e.g., the use of logo envelopes to retain carrier and mailer identities);
5. involvement in the telecommunication portion of EMS as well as printing, enveloping, and delivery; and
6. involvement in Generation III EMS as well (e.g., through lease or contract with private industry).

Each of these alternatives is technically feasible. In evaluating each, Congress may wish to take into account some or all of the following broad considerations:

- the extent to which each alternative would contribute to Generation II EMS growth and volume;
- the extent to which each alternative would favorably affect USPS finances, i.e., EMS cost displacement and contribution to covering USPS fixed costs;
- the extent to which each alternative, through creating new jobs and increasing USPS mail volumes, would defer or partially offset labor reductions that might otherwise be necessary;
- the extent to which each alternative would provide incentives for marketing by USPS and/or private firms;
- whether changes in the Postal Reorganization Act are needed to permit more flexibility in the USPS decisionmaking process (including regulatory review) with respect to USPS involvement in EMS;
- whether the term "demonstrated need" for USPS to contract with a telecommunication carrier to transmit messages electronically on behalf of USPS needs to be clarified; and
- whether or not there are any conditions that would constitute demonstrated need for USPS involvement in electronic delivery (presumably by contract with private Generation III EMS firms); for example, in geographic areas where conventional mail service could no longer be maintained at present levels.

With regard to E-COM itself, Congress may wish to review the following specific issues:

- whether or not space should be provided in SPOs for carrier output equipment;
- whether or not the technology selected by RCA for E-COM is the best available;
- whether technical modifications to the current E-COM interconnection arrangement could permit more total lines (and at what cost) for carrier and user access, and whether alternative access allocation schemes should be considered; and
- whether E-COM performance standards and design should be modified to guarantee 1-day delivery.

Reduce or Eliminate Further Regulatory and Judicial Delay

The most important action Congress can take to reduce delay is to provide clear direction for USPS involvement in EMS. A note of caution is in order. If the direction set out is not well understood and does not reflect a substantial consensus, further regulatory disputes and litigation could result.

Additionally, Congress could:

- clarify the applicability of the Private Express Statutes to delivery of Generation II EMS hardcopy output;
- delineate the division of regulatory jurisdiction between the Postal Rate Commision and the Federal Communications Commission; and
- decide on the desirability of a separate USPS entity for any EMS offering.

Strengthen Privacy and Security Protection

Privacy protection in a USPS EMS service is a continuing issue. Preliminary discussions with USPS indicate that while the E-COM equipment is apparently physically secure, the potential for security breaches does exist. User account numbers are visible on the outside of E-COM envelopes. When combined with an access code and familiarization with the E-COM technical interconnection standards, this information would permit unauthorized use of E-COM. Incoming messages are stored for 1 week in computer memory or on magnetic tape, providing another target for security violations. These archived messages could also be tapped via the management information system, since the E-COM computers in the 25 centers are connected electronically with this system.

Congress may wish to consider: 1) whether an independent review of E-COM security is warranted to ensure that adequate security measures are in place to protect the privacy of EMS messages, and 2) whether the Postal Act and/or Communications Act should be amended to provide additional statutory privacy protection (including the possible mandating of data encryption to provide additional technical privacy protection).

Maintain Oversight and Initiate Planning on USPS Long-Term Viability

Although the immediate focus is on E-COM, and on providing a clear direction for USPS involvement in EMS and resolving current regulatory problems and delays, EMS issues are likely to be with Congress for many years, driven by the impact of EMS on USPS, the role of USPS in EMS, and the broader impact of EMS on American society and the public at large. For a discussion of these broader impact areas, see the related OTA report on *Computer-Based National Information Systems* (1981). Within this context, Congress will need to maintain oversight and initiate planning on USPS long-term viability.

The following areas warrant further study:

- USPS initiatives designed to develop improved working relationships with private telecommunication and computer firms;

- joint technical and market tests with private firms to evaluate various EMS alternatives;
- use of EMS to help USPS maintain adequate service levels to rural and less populated areas;
- use of EMS to help USPS offset the reduction (or elimination) of the revenue forgone subsidy (which is provided to offset revenue losses from mail service provided at reduced rates) and permit continuation of a lower rate to nonprofit and educational organizations;
- use of EMS in the future in combination with the USPS infrastructure (perhaps scaled down) and delivery network to provide other Federal Government services (e.g, printing and delivery of forms and documents); and
- USPS long-range planning on the possible need for labor force reductions, job retraining, adjustments in retirement and new hire rates, and implications for union contract negotiations.

In view of aggressive private sector Generation III EMS activity and the continuing economic trends that work in favor of electronic mail and against paper-based mail, it seems clear that Congress and USPS should begin planning now for the future viability of USPS. Changes are taking place so fast in the so-called "communications revolution" that by the time USPS might actually experience significant impacts on mail volume, most opportunities for participation in EMS will have passed and it will be much more difficult to adjust.

NOTE: Copies of the full report "Implications of Electronic Mail and Message Systems for the U.S. Postal Service," can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, GPO stock No. 052-003-00885-8.

General Information

Information on the operation of OTA, the nature and status of ongoing assessments, or a list of available publications may be obtained by writing or calling:

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Contacts Within OTA

(OTA offices are located at 600 Pennsylvania Avenue, S.E., Washington, D.C.)

Office of the Director	224-3695
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